We Claim:

1. An electrostatically-controllable diffraction grating comprising:

a plurality of electrically isolated and stationary electrodes disposed on a substrate;

at least one row of a plurality of interconnected actuation elements, each actuation element in a row suspended, by a corresponding mechanically constrained support region, over the substrate by a vertical actuation gap, and each actuation element including a conducting actuation region connected to the corresponding actuation support region and disposed in a selected correspondence with at least one substrate electrode;

a mirror element provided for at least one actuation element in at least one row of actuation elements, each mirror element including an optically reflecting upper surface and being vertically suspended over a corresponding actuation element by a mechanically constrained mirror support region connected to the corresponding actuation element and defining a vertical mirror gap, each mirror element including a mirror deflection region connected to the mirror support region and free to be deflected through the mirror gap; and

wherein the mirror gap of a mirror element is less than the actuation gap of a corresponding actuation element and is selected to produce controlled and stable displacement of the actuation region of a corresponding actuation element through a displacement range to a specified point in the actuation gap when an actuation voltage is applied between an actuation region and a corresponding stationary electrode, for diffracting a beam of light incident on the grating as the light beam is reflected from the upper surfaces of the mirror elements.

2. The electrostatically-controllable diffraction grating of claim 1 wherein the mirror element provided for at least one actuation element in at least one row of actuation elements comprises a row of a plurality of interconnected mirror elements provided for at least one row of actuation elements.

3. The electrostatically-controllable diffraction grating of claim 2 wherein the optically reflecting upper surface of at least one mirror element in a row of mirror elements is characterized by a substantial planarity, parallel with the substrate, that is maintained as a corresponding mirror deflection region is deflected through the mirror gap.

4. The electrostatically-controllable diffraction grating of claim 1 wherein the at least one row of actuation elements comprises a plurality of rows of actuation elements.

5. The electrostatically-controllable diffraction grating of claim 4 wherein the mirror element provided for at least one actuation element in at least one row of actuation elements comprises a mirror element provided for at least one actuation element in each row of actuation elements.

6. The electrostatically-controllable diffraction grating of claim 5 wherein the optically reflecting upper surface of at least one mirror element provided for a row of actuation elements is characterized by a substantial planarity and by a substantial parallelism with the optically reflecting upper surface of at least one mirror element provided in another row of actuation elements, the upper surface planarity and parallelism being maintained as a corresponding mirror deflection region is deflected through the mirror gap.

7. The electrostatically-controllable diffraction grating of claim 6 wherein the optically reflecting upper surface of each mirror element is parallel to the optically reflecting upper surface of all other mirror elements.

8. The electrostatically-controllable diffraction grating of claim 4 wherein at least one of the plurality of rows of actuation elements is provided with a row of a plurality of interconnected mirror elements.

9. The electrostatically-controllable diffraction grating of claim 1 wherein the mirror gap is further selected to maintain a substantial planarity of the mirror element deflection region during stable displacement of a corresponding actuation region.

10. The electrostatically-controllable diffraction grating of claim 9 wherein the mirror gap is further selected to maintain a substantial parallelism of the planar mirror element deflection region with the substrate during stable displacement of a corresponding actuation region.

11. The electrostatically-controllable diffraction grating of claim 1 wherein the optically reflecting mirror element upper surface is characterized by a substantial planarity that is maintained as a corresponding mirror deflection region is deflected through the mirror gap.

12. The electrostatically-controllable diffraction grating of claim 11 wherein the optically reflecting mirror element upper surface is further characterized by a substantial parallelism with the substrate that is maintained as a corresponding mirror deflection region is deflected through the mirror gap.

13. The electrostatically-controllable diffraction grating of claim 1 wherein each actuation element further comprises an actuation element deflection region free to be deflected through the actuation gap, the actuation region extending from about the actuation support region to the actuation element deflection region, a commonality in area between the actuation region and a corresponding stationary electrode being selected to produce controlled and stable displacement of the actuation element deflection region over a displacement range extending to the specified point in the actuation gap.

14. The electrostatically-controllable diffraction grating of claim 1 wherein the substrate comprises silicon.

15. The electrostatically-controllable diffraction grating of claim 14 wherein the silicon substrate further comprises an insulating surface layer.

16. The electrostatically-controllable diffraction grating of claim 1 wherein the electrodes comprise polycrystalline silicon.

17. The electrostatically-controllable diffraction grating of claim 1 wherein the actuation elements comprise polycrystalline silicon.

18. The electrostatically-controllable diffraction grating of claim 1 wherein the mirror element comprises polycrystalline silicon.

19. The electrostatically-controllable diffraction grating of claim 1 wherein the optically reflecting mirror element upper surface comprises a gold layer.

20. An electrostatically-controllable actuator comprising:

a stationary electrode;

an actuation element separated from the stationary electrode by an actuation gap, the actuation element including a mechanically constrained actuation support region and a conducting actuation region connected to the actuation support region and free to be deflected through the actuation gap;

an auxiliary element separated from the actuation element by an auxiliary gap, the auxiliary element including a mechanically constrained auxiliary support region connected to the actuation element and a deflection region connected to the auxiliary support region and free to be deflected through the auxiliary gap; and

wherein the auxiliary gap is less than the actuation gap, the auxiliary gap being selected to produce controlled and stable displacement of the actuation region over a displacement range extending to a specified point in the actuation gap when an actuation voltage is applied between the actuation region and the stationary electrode and selected to maintain a substantial planarity and parallelism of the auxiliary element deflection region with the stationary electrode during stable displacement of the actuation region.

21. The electrostatically-controllable actuator of claim 16 wherein the auxiliary element comprises a horizontal upper surface that is characterized by a substantial planarity that is maintained as the actuation region is displaced.

22. The electrostatically-controllable actuator of claim 16 wherein the actuation element further comprises an actuation element deflection region free to be deflected through the actuation gap, the actuation region extending from about the actuation support region to the actuation element deflection region, a commonality in area between the actuation region and

the stationary electrode being selected to produce controlled and stable displacement of the actuation element deflection region over a displacement range extending to the specified point in the actuation gap.